FIG.1

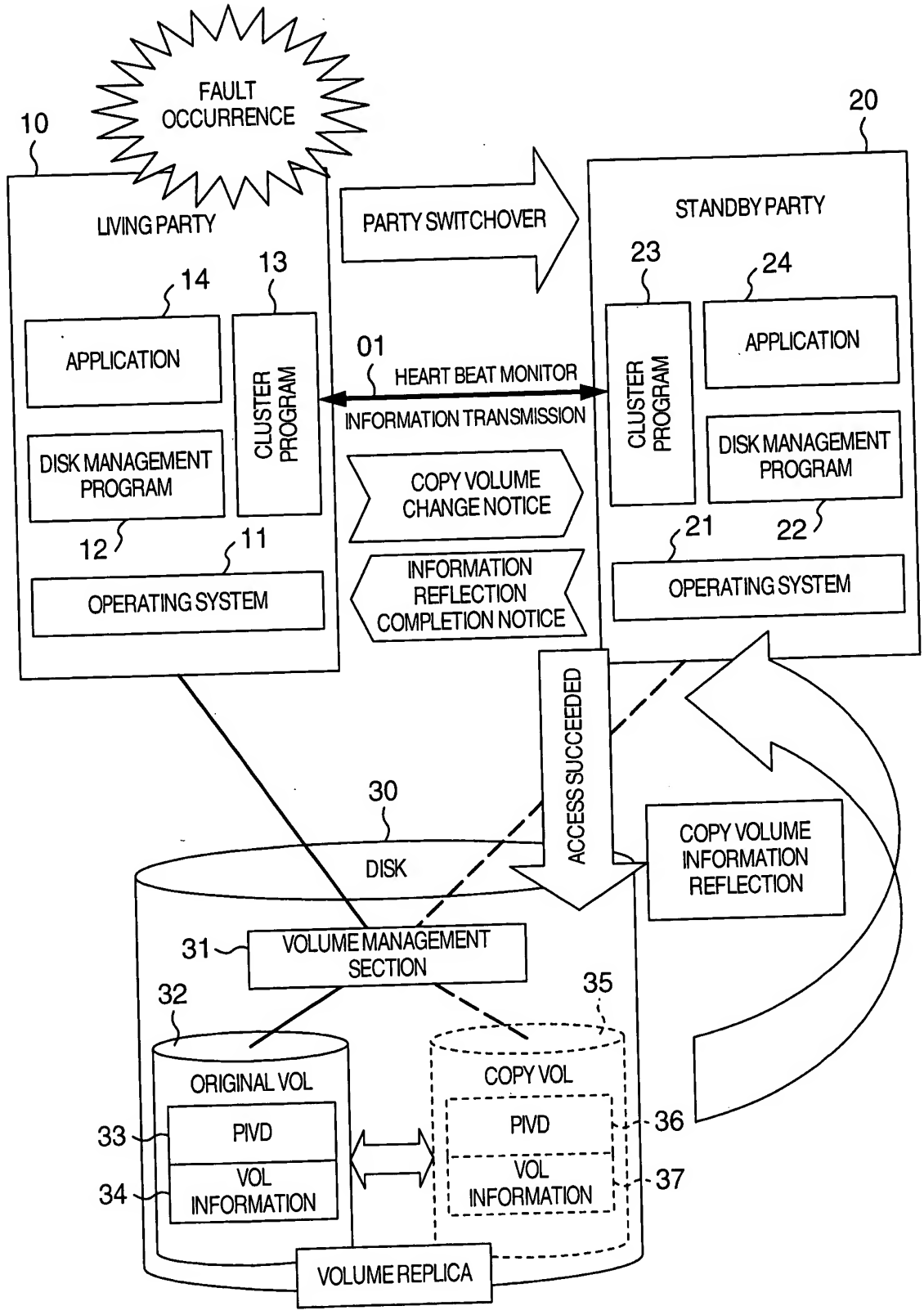
FAULT OCCURRENCE
10
LIVING PARTY
14
APPLICATION
13
CLUSTER PROGRAM
DISK MANAGEMENT PROGRAM
12
11
OPERATING SYSTEM
PARTY SWITCHOVER
01
HEART BEAT MONITOR
INFORMATION TRANSMISSION
COPY VOLUME CHANGE NOTICE
INFORMATION REFLECTION COMPLETION NOTICE
20
STANDBY PARTY
23
CLUSTER PROGRAM
24
APPLICATION
DISK MANAGEMENT PROGRAM
21
22
OPERATING SYSTEM
ACCESS SUCCEEDED
COPY VOLUME INFORMATION REFLECTION
30
DISK
31
VOLUME MANAGEMENT SECTION
32
35
ORIGINAL VOL
COPY VOL
33
PIVD
34
VOL INFORMATION
PIVD
36
VOL INFORMATION
37
VOLUME REPLICA

FIG.2

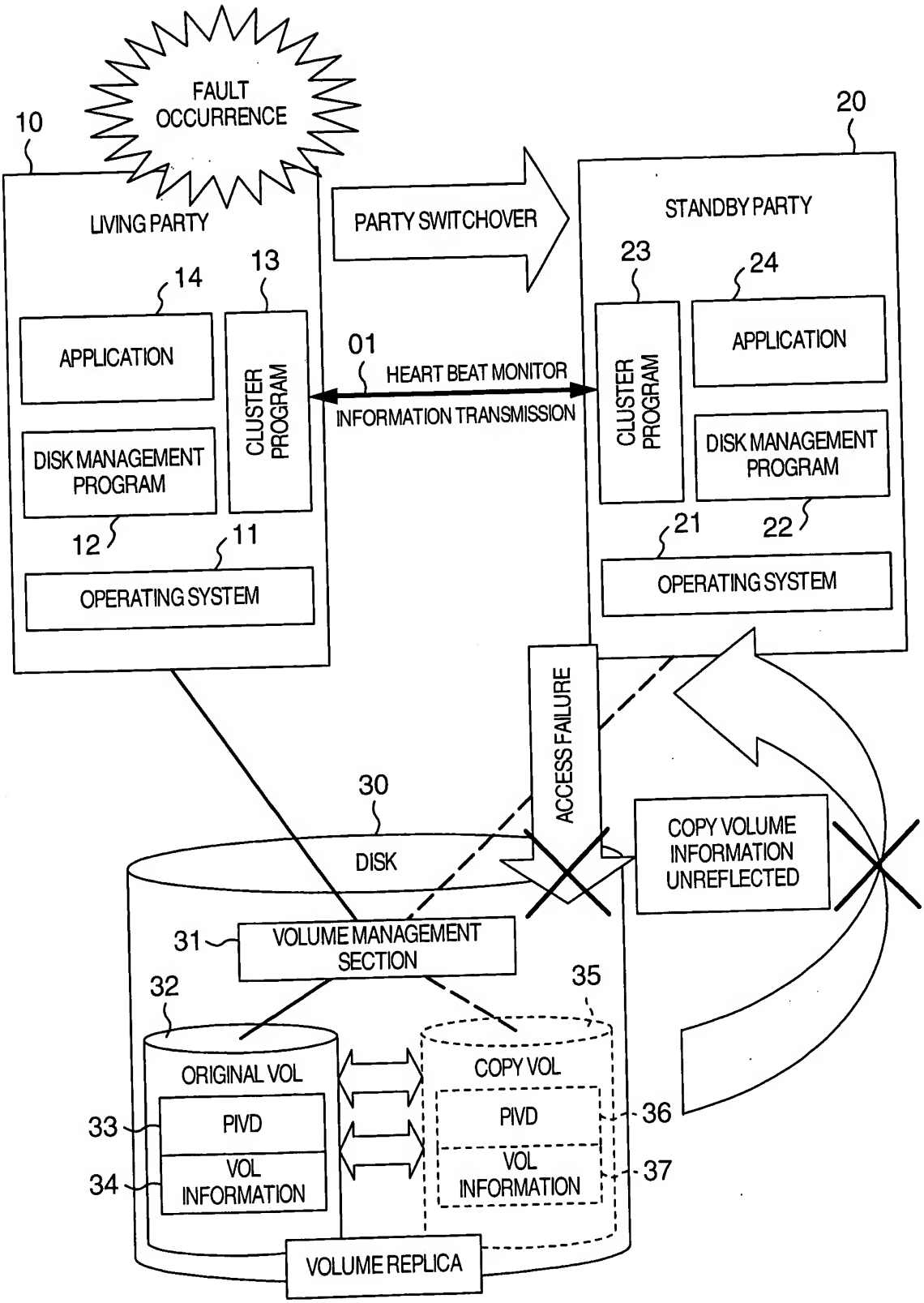
FAULT OCCURRENCE
10
20
LIVING PARTY
PARTY SWITCHOVER
STANDBY PARTY
14
13
23
24
APPLICATION
CLUSTER PROGRAM
01
HEART BEAT MONITOR
INFORMATION TRANSMISSION
CLUSTER PROGRAM
APPLICATION
DISK MANAGEMENT PROGRAM
DISK MANAGEMENT PROGRAM
12
11
21
22
OPERATING SYSTEM
OPERATING SYSTEM
ACCESS FAILURE
30
DISK
COPY VOLUME INFORMATION UNREFLECTED
31
VOLUME MANAGEMENT SECTION
32
35
ORIGINAL VOL
COPY VOL
PIVD
PIVD
33
36
VOL INFORMATION
VOL INFORMATION
34
37
VOLUME REPLICA

FIG.3

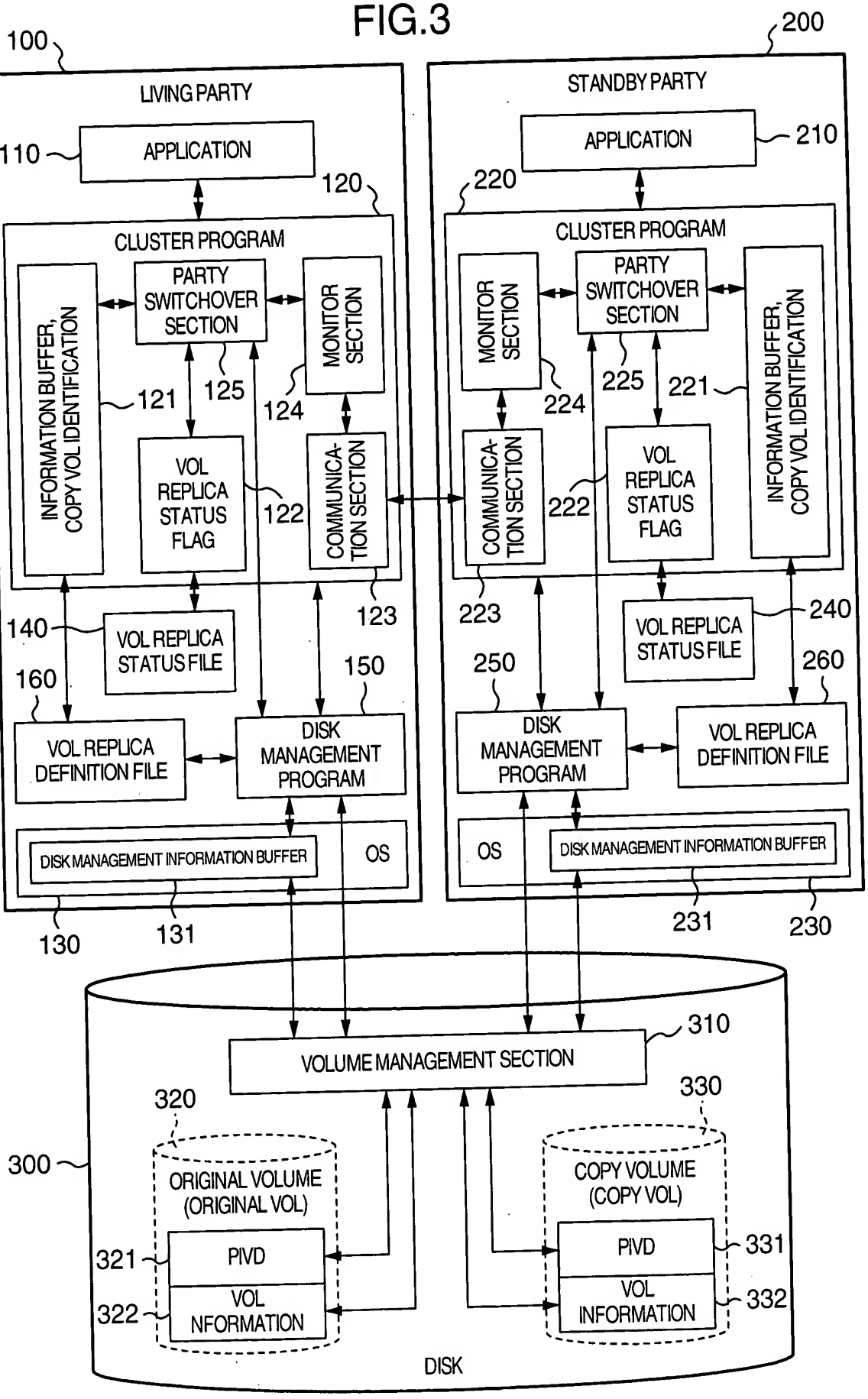
100
LIVING PARTY
110
APPLICATION
120
CLUSTER PROGRAM
INFORMATION BUFFER, COPY VOL IDENTIFICATION
121
PARTY SWITCHOVER SECTION
125
MONITOR SECTION
124
VOL REPLICA STATUS FLAG
122
COMMUNICATION SECTION
123
140
VOL REPLICA STATUS FILE
160
VOL REPLICA DEFINITION FILE
150
DISK MANAGEMENT PROGRAM
DISK MANAGEMENT INFORMATION BUFFER
OS
130
131
200
STANDBY PARTY
APPLICATION
210
220
CLUSTER PROGRAM
MONITOR SECTION
224
PARTY SWITCHOVER SECTION
225
221
INFORMATION BUFFER, COPY VOL IDENTIFICATION
COMMUNICATION SECTION
222
VOL REPLICA STATUS FLAG
223
240
VOL REPLICA STATUS FILE
250
260
DISK MANAGEMENT PROGRAM
VOL REPLICA DEFINITION FILE
OS
DISK MANAGEMENT INFORMATION BUFFER
231
230
310
VOLUME MANAGEMENT SECTION
320
330
300
ORIGINAL VOLUME (ORIGINAL VOL)
COPY VOLUME (COPY VOL)
321
PIVD
331
322
VOL NFORMATION
VOL INFORMATION
332
DISK

FIG.4

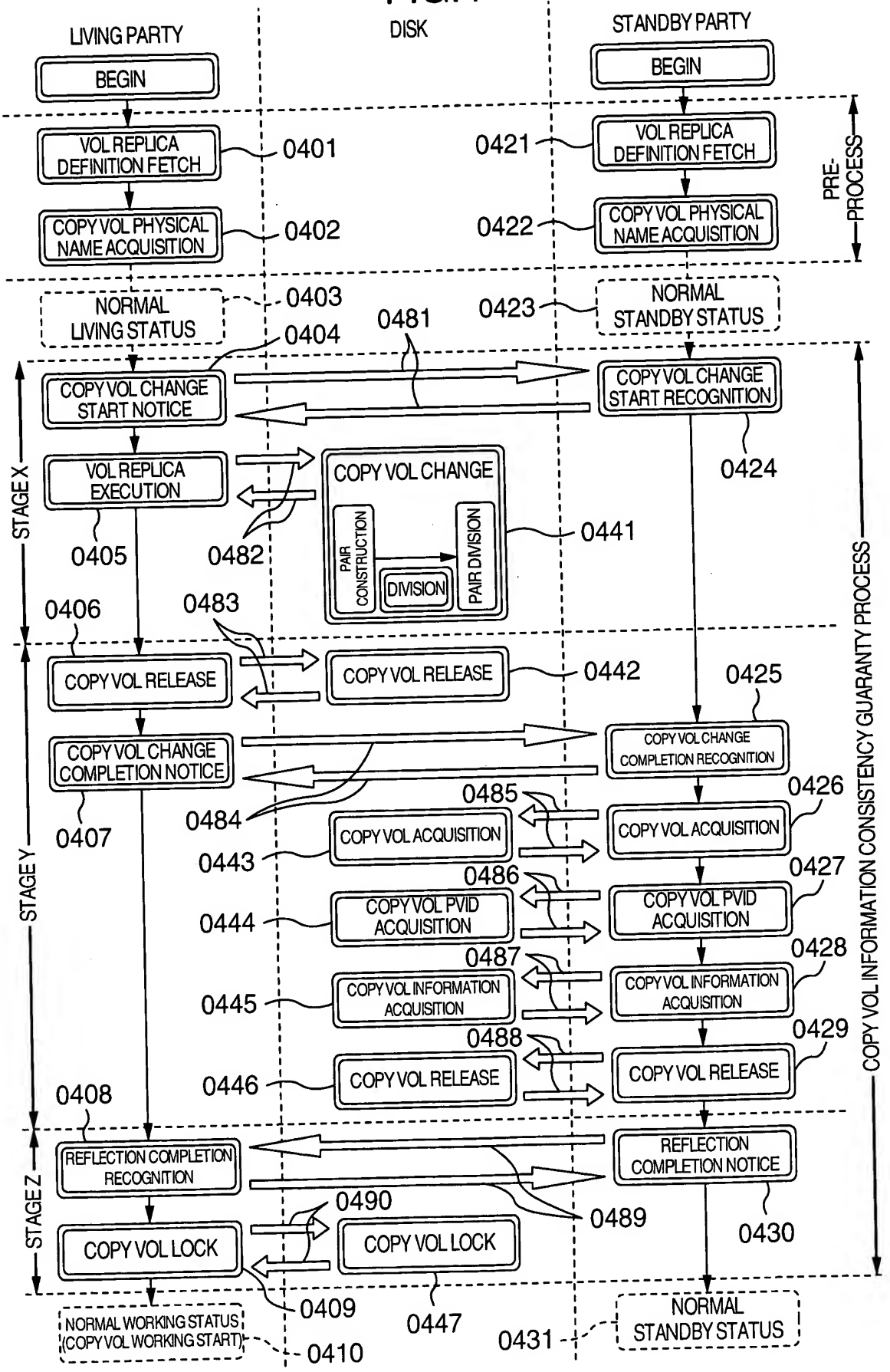
LIVING PARTY
DISK
STANDBY PARTY
BEGIN
BEGIN
VOL REPLICA DEFINITION FETCH
0401
0421
VOL REPLICA DEFINITION FETCH
PRE-PROCESS
COPY VOL PHYSICAL NAME ACQUISITION
0402
0422
COPY VOL PHYSICAL NAME ACQUISITION
NORMAL LIVING STATUS
0403
0423
NORMAL STANDBY STATUS
0481
0404
COPY VOL CHANGE START NOTICE
COPY VOL CHANGE START RECOGNITION
0424
VOL REPLICA EXECUTION
COPY VOL CHANGE
PAIR CONSTRUCTION
DIVISION
PAIR DIVISION
0441
0405
0482
0406
0483
COPY VOL RELEASE
COPY VOL RELEASE
0442
0425
COPY VOL CHANGE COMPLETION NOTICE
COPY VOL CHANGE COMPLETION RECOGNITION
0485
0426
0484
0407
COPY VOL ACQUISITION
COPY VOL ACQUISITION
0443
0486
0427
COPY VOL PVID ACQUISITION
COPY VOL PVID ACQUISITION
0444
0487
0428
COPY VOL INFORMATION ACQUISITION
COPY VOL INFORMATION ACQUISITION
0445
0488
0429
COPY VOL RELEASE
COPY VOL RELEASE
0446
0408
REFLECTION COMPLETION RECOGNITION
REFLECTION COMPLETION NOTICE
0490
0489
0430
COPY VOL LOCK
COPY VOL LOCK
0409
0447
NORMAL WORKING STATUS (COPY VOL WORKING START)
0410
0431
NORMAL STANDBY STATUS
STAGE X
STAGE Y
STAGE Z
COPY VOL INFORMATION CONSISTENCY GUARANTY PROCESS

FIG.5

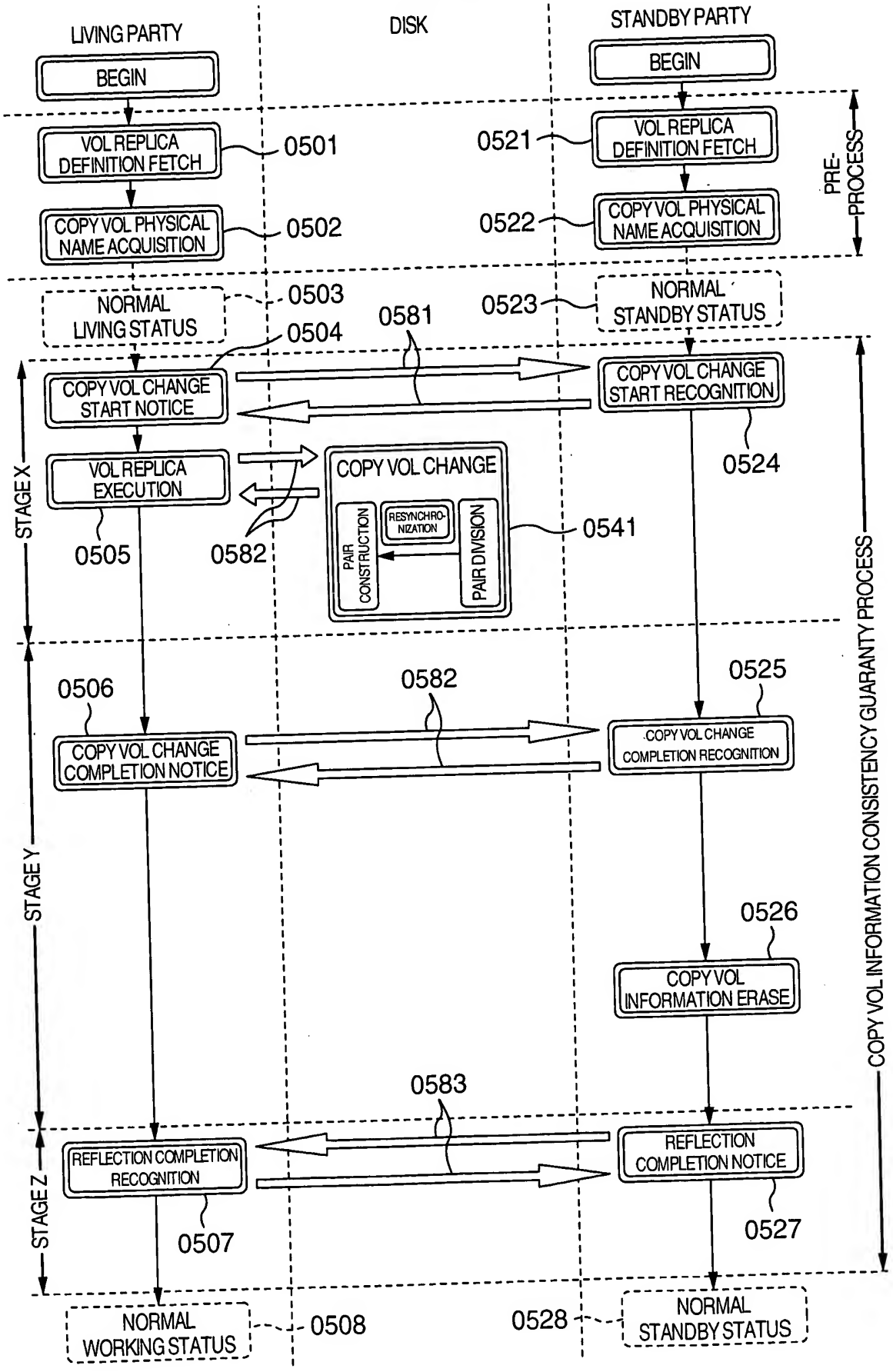
LIVING PARTY
DISK
STANDBY PARTY
BEGIN
BEGIN
VOL REPLICA DEFINITION FETCH
0501
0521
VOL REPLICA DEFINITION FETCH
PRE-PROCESS
COPY VOL PHYSICAL NAME ACQUISITION
0502
0522
COPY VOL PHYSICAL NAME ACQUISITION
NORMAL LIVING STATUS
0503
0523
NORMAL STANDBY STATUS
0581
0504
COPY VOL CHANGE START NOTICE
COPY VOL CHANGE START RECOGNITION
0524
STAGE X
VOL REPLICA EXECUTION
COPY VOL CHANGE
RESYNCHRO-NIZATION
PAIR CONSTRUCTION
PAIR DIVISION
0541
0505
0582
0506
0582
0525
COPY VOL CHANGE COMPLETION NOTICE
COPY VOL CHANGE COMPLETION RECOGNITION
STAGE Y
0526
COPY VOL INFORMATION ERASE
COPY VOL INFORMATION CONSISTENCY GUARANTY PROCESS
0583
REFLECTION COMPLETION RECOGNITION
REFLECTION COMPLETION NOTICE
STAGE Z
0507
0527
NORMAL WORKING STATUS
0508
0528
NORMAL STANDBY STATUS

FIG.6

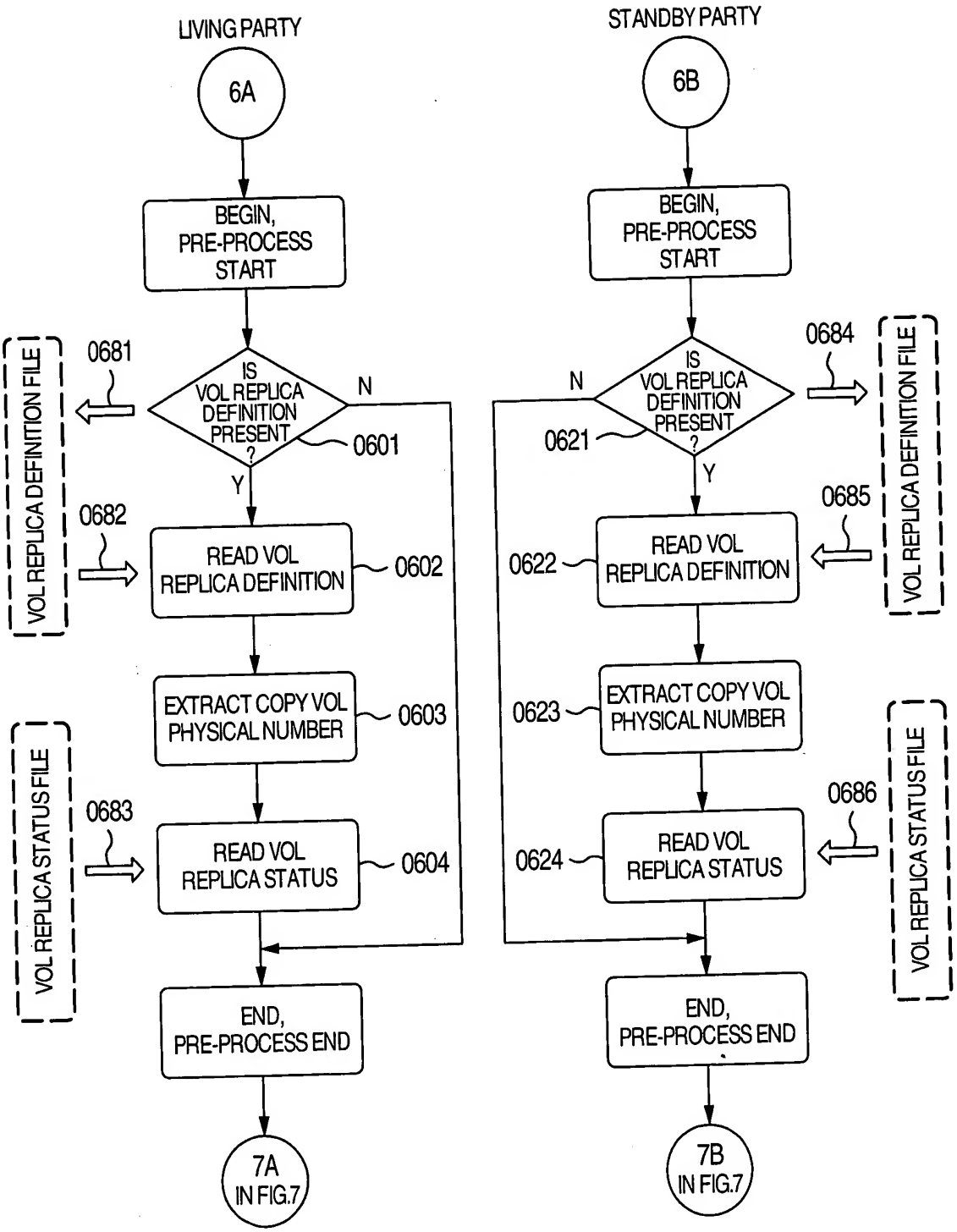
LIVING PARTY
6A
BEGIN, PRE-PROCESS START
0681
IS VOL REPLICA DEFINITION PRESENT ?
N
Y
0601
VOL REPLICA DEFINITION FILE
0682
READ VOL REPLICA DEFINITION
0602
EXTRACT COPY VOL PHYSICAL NUMBER
0603
VOL REPLICA STATUS FILE
0683
READ VOL REPLICA STATUS
0604
END, PRE-PROCESS END
7A IN FIG.7
STANDBY PARTY
6B
BEGIN, PRE-PROCESS START
0684
IS VOL REPLICA DEFINITION PRESENT ?
N
Y
0621
VOL REPLICA DEFINITION FILE
0685
READ VOL REPLICA DEFINITION
0622
EXTRACT COPY VOL PHYSICAL NUMBER
0623
VOL REPLICA STATUS FILE
0686
READ VOL REPLICA STATUS
0624
END, PRE-PROCESS END
7B IN FIG.7

FIG.7

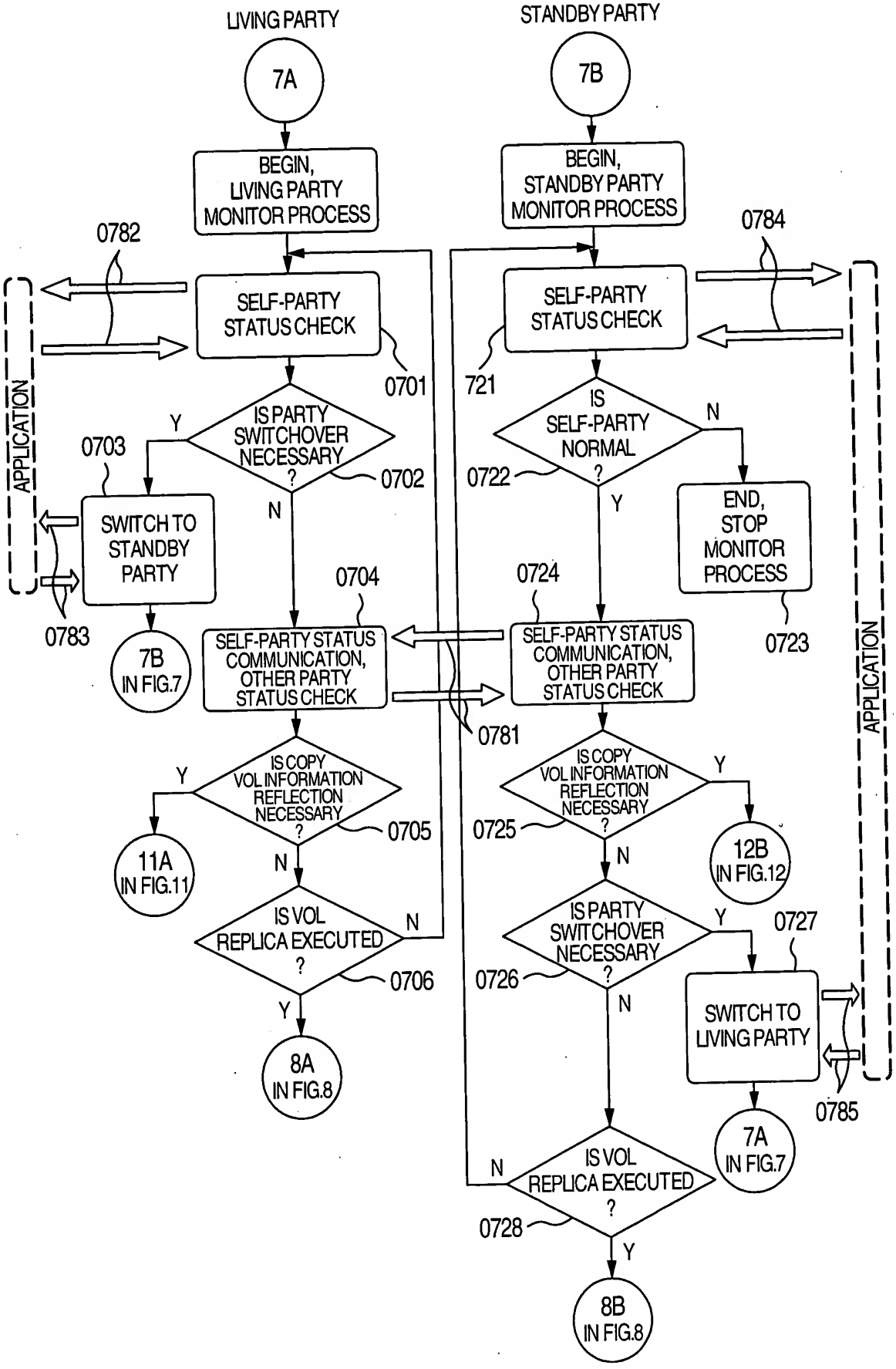
LIVING PARTY
STANDBY PARTY
7A
7B
BEGIN, LIVING PARTY MONITOR PROCESS
BEGIN, STANDBY PARTY MONITOR PROCESS
0782
0784
SELF-PARTY STATUS CHECK
SELF-PARTY STATUS CHECK
0701
721
APPLICATION
IS PARTY SWITCHOVER NECESSARY ?
IS SELF-PARTY NORMAL ?
Y
N
0703
0702
0722
SWITCH TO STANDBY PARTY
END, STOP MONITOR PROCESS
0704
0724
0783
7B IN FIG.7
SELF-PARTY STATUS COMMUNICATION, OTHER PARTY STATUS CHECK
SELF-PARTY STATUS COMMUNICATION, OTHER PARTY STATUS CHECK
0723
0781
IS COPY VOL INFORMATION REFLECTION NECESSARY ?
0705
0725
11A IN FIG.11
12B IN FIG.12
IS VOL REPLICA EXECUTED ?
0706
IS PARTY SWITCHOVER NECESSARY ?
0727
0726
SWITCH TO LIVING PARTY
0785
8A IN FIG.8
7A IN FIG.7
IS VOL REPLICA EXECUTED ?
0728
8B IN FIG.8

FIG.8

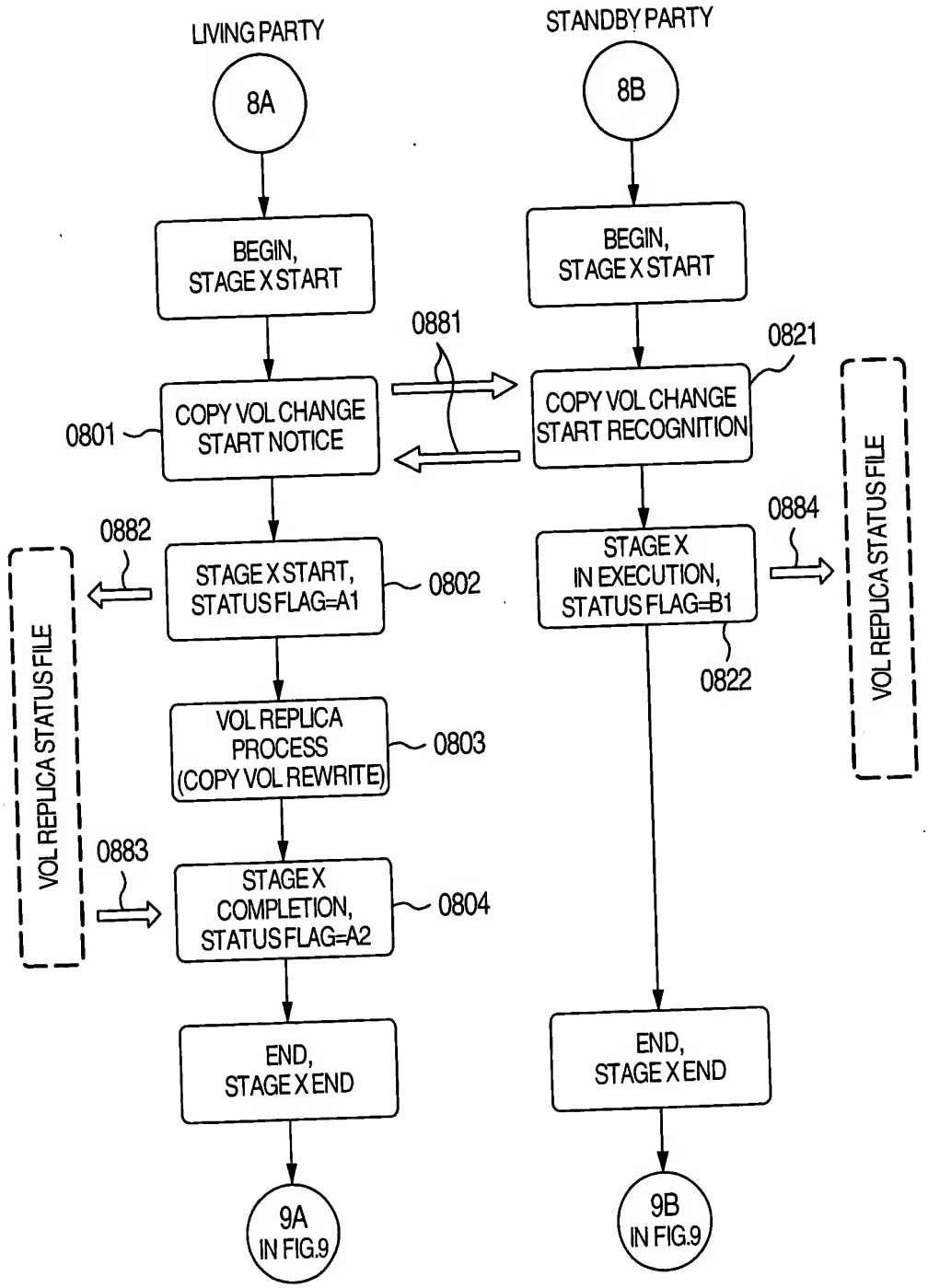
LIVING PARTY
STANDBY PARTY
8A
8B
BEGIN,
STAGE X START
BEGIN,
STAGE X START
0881
0821
COPY VOL CHANGE
START NOTICE
COPY VOL CHANGE
START RECOGNITION
0801
0882
0884
STAGE X START,
STATUS FLAG=A1
0802
STAGE X
IN EXECUTION,
STATUS FLAG=B1
VOL REPLICA STATUS FILE
VOL REPLICA STATUS FILE
0822
VOL REPLICA
PROCESS
(COPY VOL REWRITE)
0803
0883
STAGE X
COMPLETION,
STATUS FLAG=A2
0804
END,
STAGE X END
END,
STAGE X END
9A
IN FIG.9
9B
IN FIG.9

FIG.9

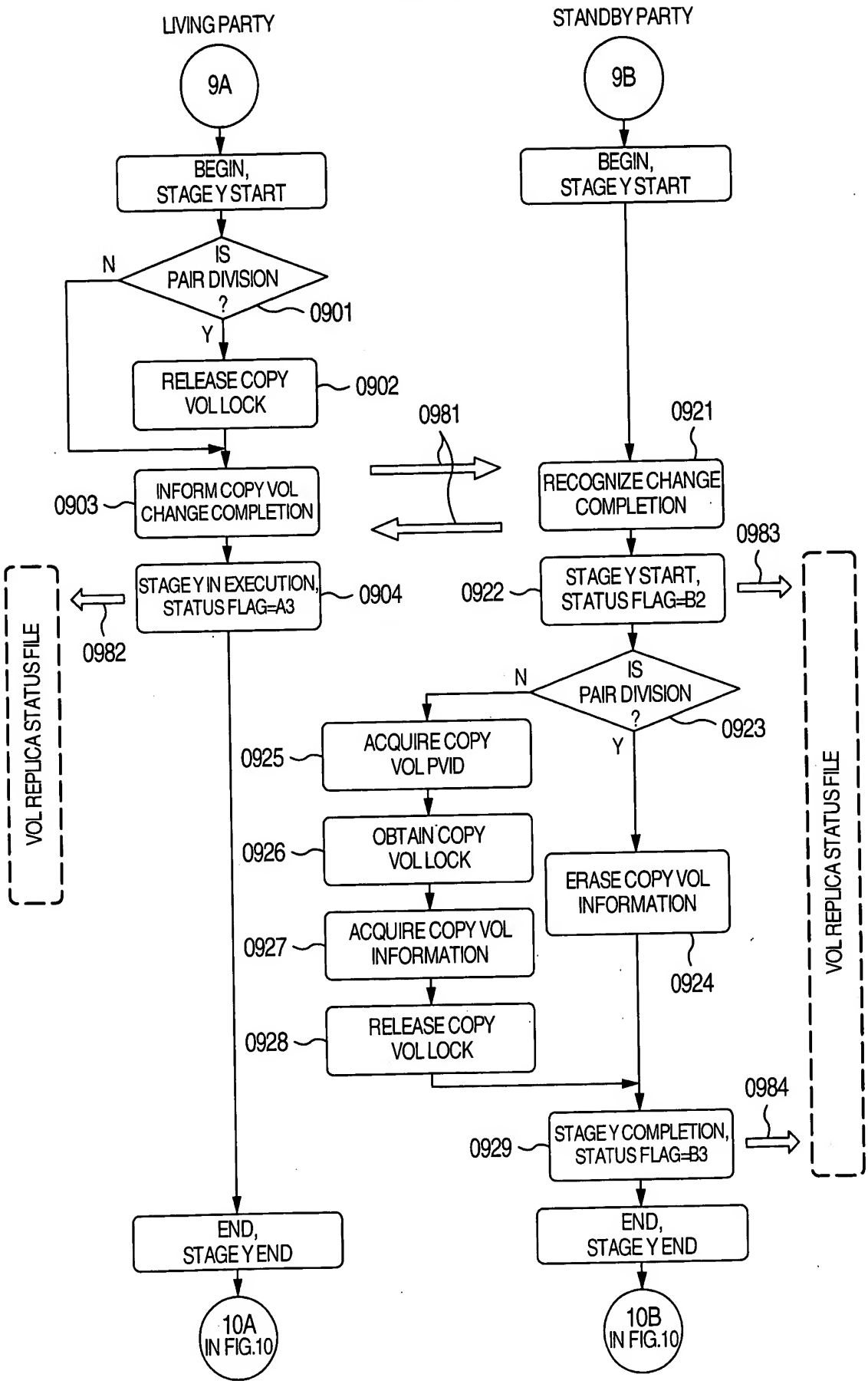
LIVING PARTY
STANDBY PARTY
9A
9B
BEGIN, STAGE Y START
BEGIN, STAGE Y START
IS PAIR DIVISION ?
N
Y
0901
RELEASE COPY VOL LOCK
0902
0981
0921
INFORM COPY VOL CHANGE COMPLETION
0903
RECOGNIZE CHANGE COMPLETION
0983
STAGE Y IN EXECUTION, STATUS FLAG=A3
0904
0982
STAGE Y START, STATUS FLAG=B2
0922
VOL REPLICA STATUS FILE
IS PAIR DIVISION ?
N
Y
0923
ACQUIRE COPY VOL PVID
0925
OBTAIN COPY VOL LOCK
0926
ACQUIRE COPY VOL INFORMATION
0927
RELEASE COPY VOL LOCK
0928
ERASE COPY VOL INFORMATION
0924
0984
STAGE Y COMPLETION, STATUS FLAG=B3
0929
VOL REPLICA STATUS FILE
END, STAGE Y END
END, STAGE Y END
10A IN FIG.10
10B IN FIG.10

FIG.10

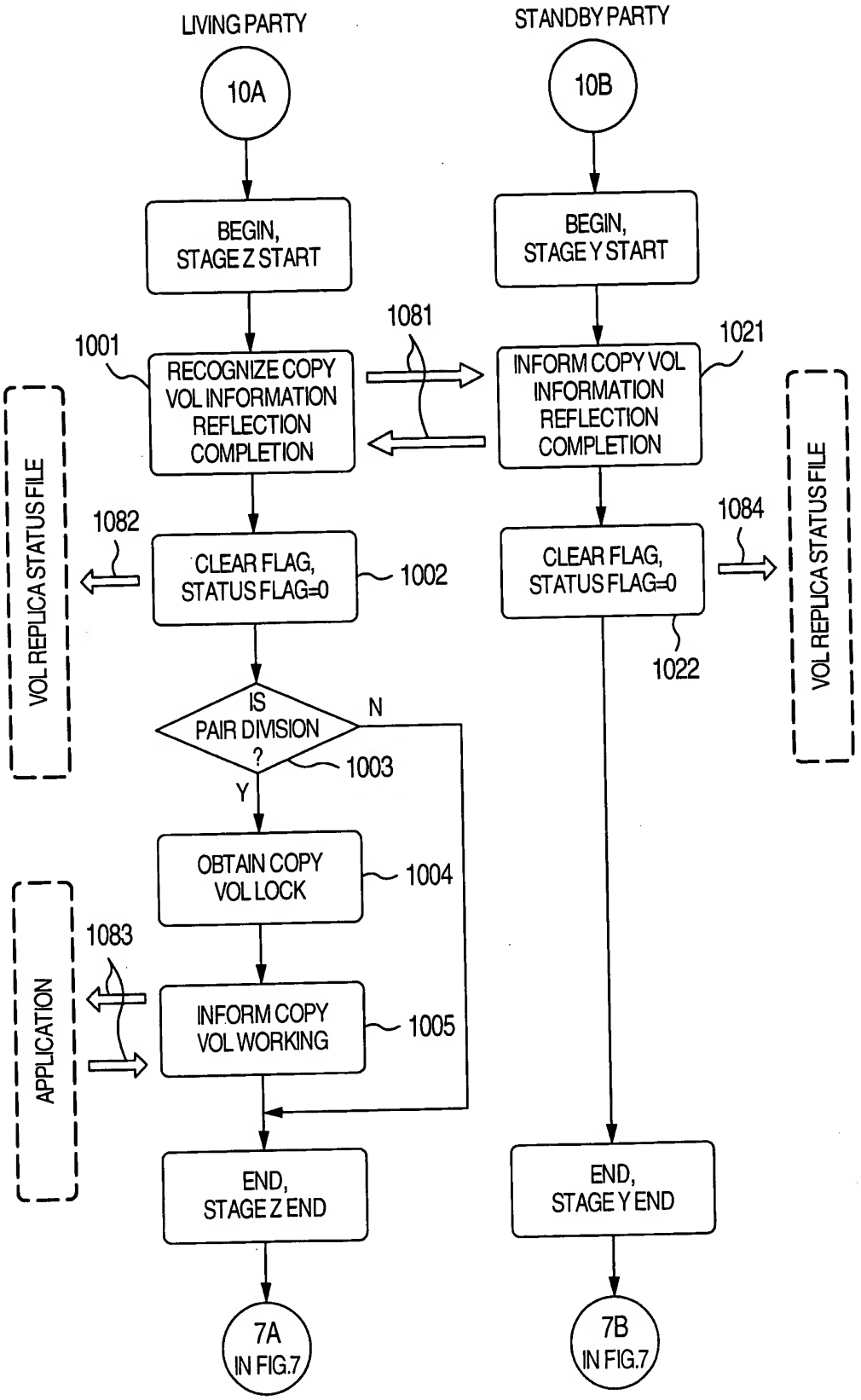
LIVING PARTY
STANDBY PARTY
10A
10B
BEGIN, STAGE Z START
BEGIN, STAGE Y START
1001
1081
1021
RECOGNIZE COPY VOL INFORMATION REFLECTION COMPLETION
INFORM COPY VOL INFORMATION REFLECTION COMPLETION
VOL REPLICA STATUS FILE
1082
1084
CLEAR FLAG, STATUS FLAG=0
1002
CLEAR FLAG, STATUS FLAG=0
1022
VOL REPLICA STATUS FILE
IS PAIR DIVISION ?
N
1003
Y
OBTAIN COPY VOL LOCK
1004
APPLICATION
1083
INFORM COPY VOL WORKING
1005
END, STAGE Z END
END, STAGE Y END
7A IN FIG.7
7B IN FIG.7

FIG.11

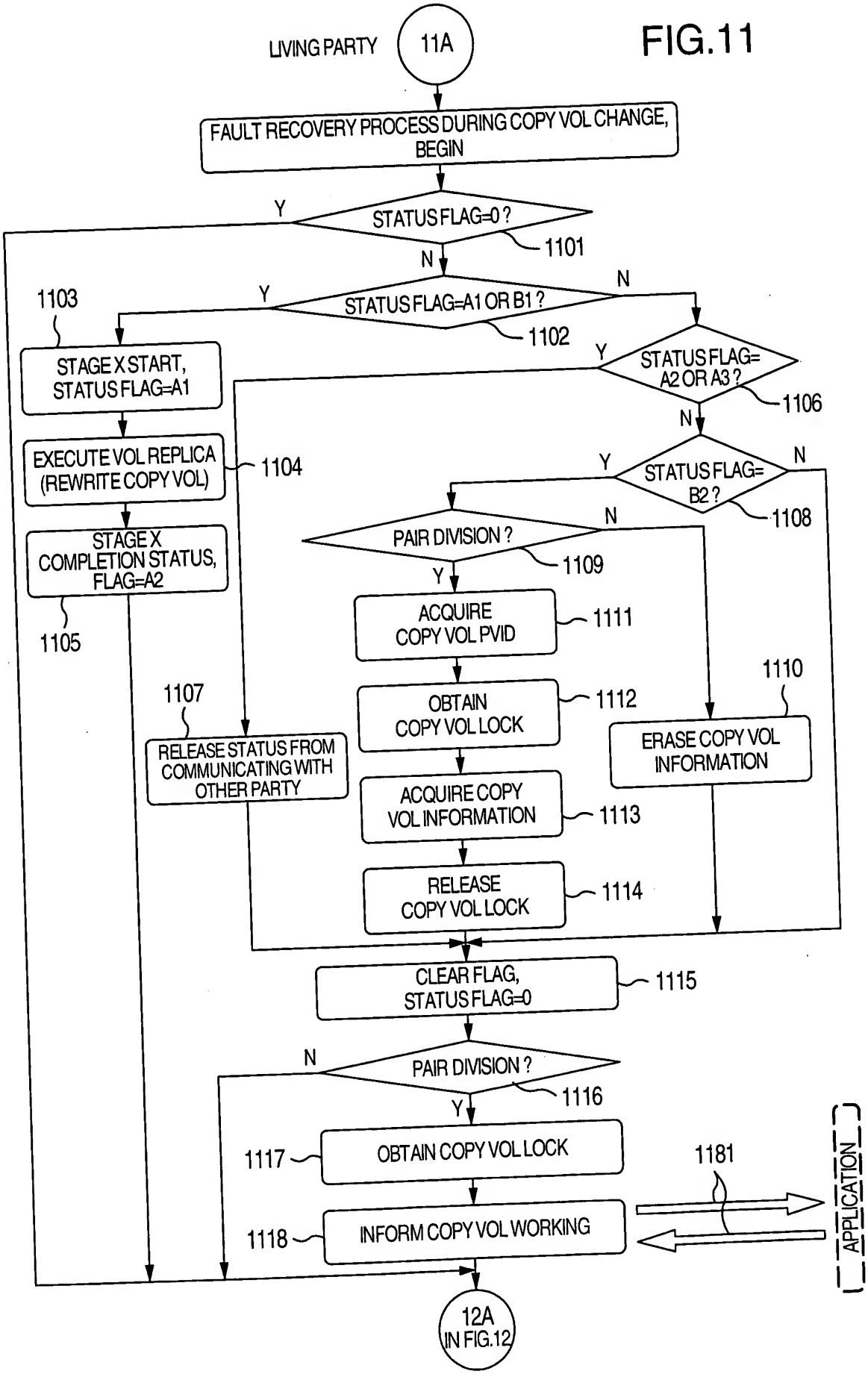
LIVING PARTY
11A
FAULT RECOVERY PROCESS DURING COPY VOL CHANGE, BEGIN
STATUS FLAG=0 ?
1101
Y
N
STATUS FLAG=A1 OR B1 ?
1102
1103
STAGE X START, STATUS FLAG=A1
EXECUTE VOL REPLICA (REWRITE COPY VOL)
1104
STAGE X COMPLETION STATUS, FLAG=A2
1105
STATUS FLAG= A2 OR A3 ?
1106
STATUS FLAG= B2 ?
1108
PAIR DIVISION ?
1109
ACQUIRE COPY VOL PVID
1111
OBTAIN COPY VOL LOCK
1112
ACQUIRE COPY VOL INFORMATION
1113
RELEASE COPY VOL LOCK
1114
1107
RELEASE STATUS FROM COMMUNICATING WITH OTHER PARTY
1110
ERASE COPY VOL INFORMATION
CLEAR FLAG, STATUS FLAG=0
1115
PAIR DIVISION ?
1116
OBTAIN COPY VOL LOCK
1117
INFORM COPY VOL WORKING
1118
1181
APPLICATION
12A IN FIG.12

FIG.12

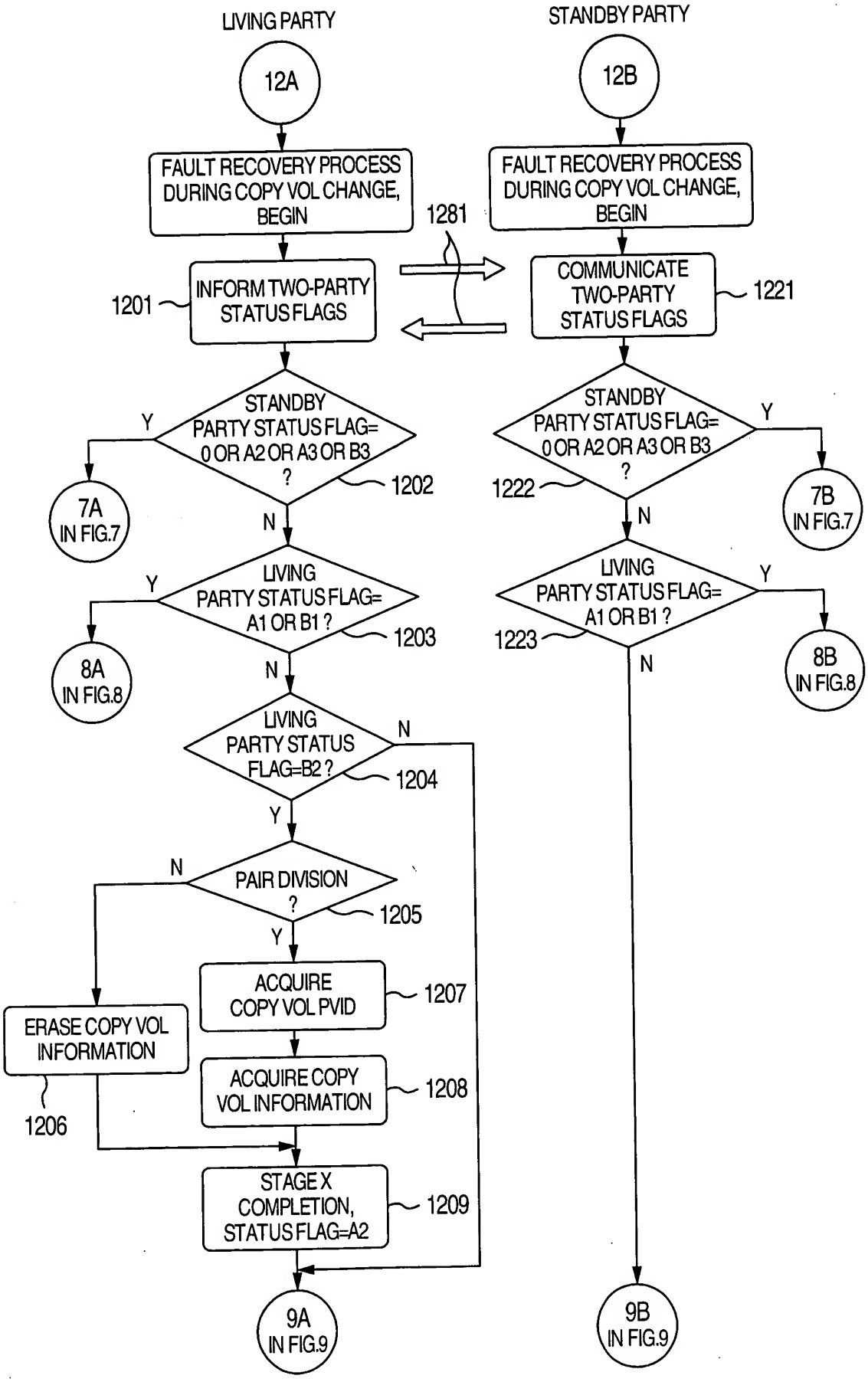
LIVING PARTY
STANDBY PARTY
12A
12B
FAULT RECOVERY PROCESS DURING COPY VOL CHANGE, BEGIN
FAULT RECOVERY PROCESS DURING COPY VOL CHANGE, BEGIN
1281
INFORM TWO-PARTY STATUS FLAGS
1201
COMMUNICATE TWO-PARTY STATUS FLAGS
1221
STANDBY PARTY STATUS FLAG= 0 OR A2 OR A3 OR B3 ?
1202
Y
N
7A IN FIG.7
STANDBY PARTY STATUS FLAG= 0 OR A2 OR A3 OR B3 ?
1222
Y
N
7B IN FIG.7
LIVING PARTY STATUS FLAG= A1 OR B1 ?
1203
Y
N
8A IN FIG.8
LIVING PARTY STATUS FLAG= A1 OR B1 ?
1223
Y
N
8B IN FIG.8
LIVING PARTY STATUS FLAG=B2 ?
1204
N
Y
PAIR DIVISION ?
1205
N
Y
ACQUIRE COPY VOL PVID
1207
ERASE COPY VOL INFORMATION
1206
ACQUIRE COPY VOL INFORMATION
1208
STAGE X COMPLETION, STATUS FLAG=A2
1209
9A IN FIG.9
9B IN FIG.9

FIG.13

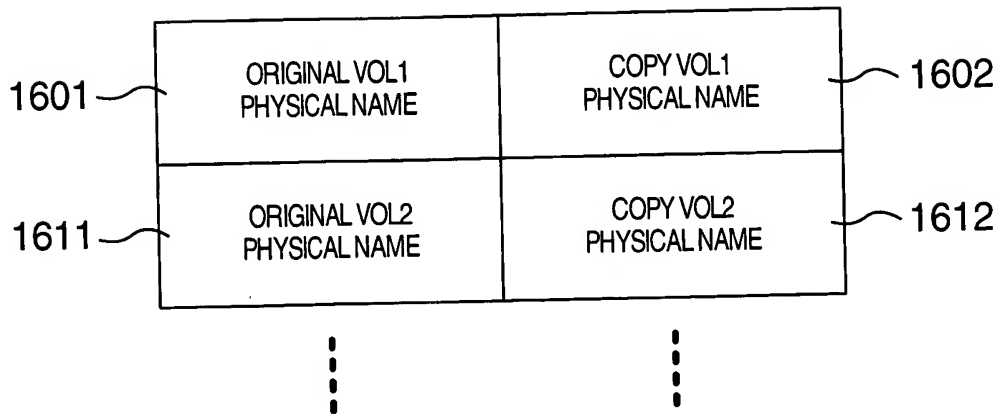
1601
ORIGINAL VOL1 PHYSICAL NAME
COPY VOL1 PHYSICAL NAME
1602
1611
ORIGINAL VOL2 PHYSICAL NAME
COPY VOL2 PHYSICAL NAME
1612

FIG.14

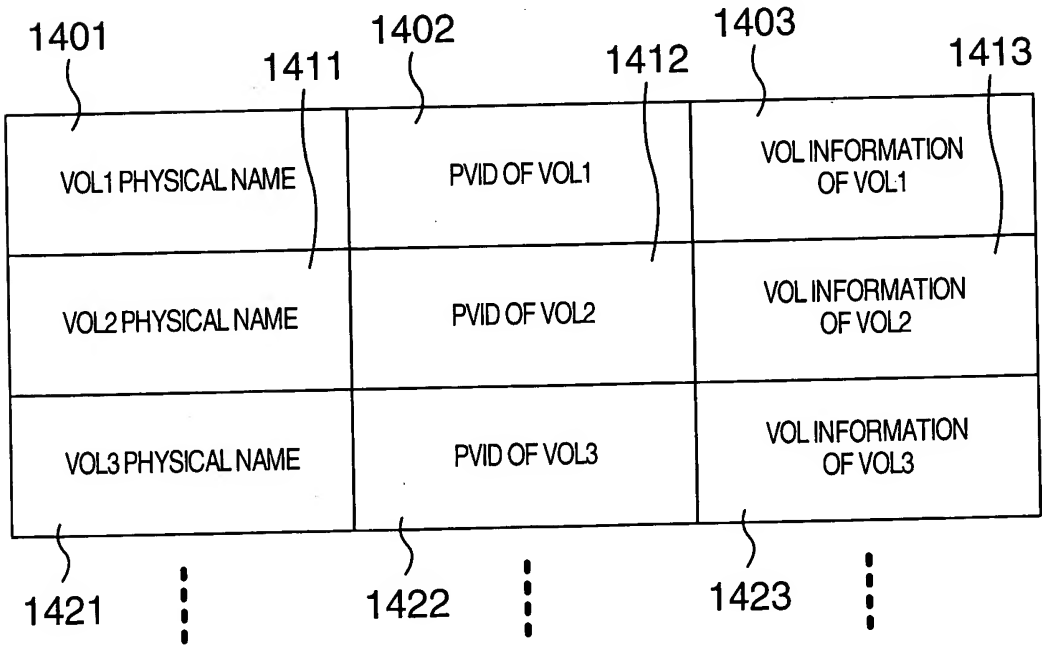
1401
1411
1402
1412
1403
1413
VOL1 PHYSICAL NAME
PVID OF VOL1
VOL INFORMATION OF VOL1
VOL2 PHYSICAL NAME
PVID OF VOL2
VOL INFORMATION OF VOL2
VOL3 PHYSICAL NAME
PVID OF VOL3
VOL INFORMATION OF VOL3
1421
1422
1423

FIG.15

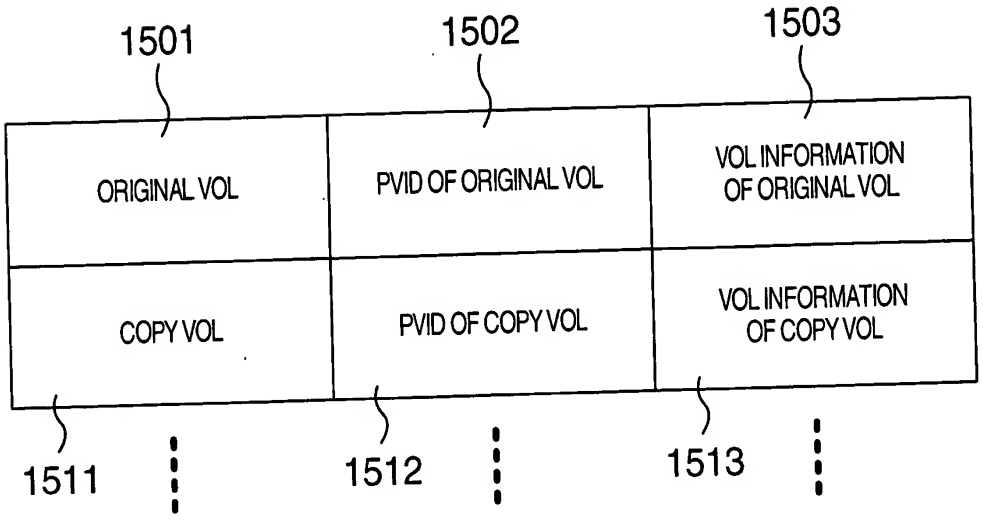

FIG.16

1600 PAIR IDENTIFIER	1601 ORIGINAL VOL PHYSICAL NAME	1602 COPY VOL PHYSICAL NAME	1603 LIVING PARTY STATUS FLAG	1604 STANDBY PARTY STATUS FLAG	1605 DIVISION FLAG
1	hdisk0	hdisk100	A1	B1	PAIR DIVISION
2	hdisk3	hdisk104	B2	A3	PAIR RECONSTRUCTION
N	hdisk20	hdisk75	0	0	